GROUND SURVEYS IN THE MACKENZIE BISON SANCTUARY, 1981

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ABSTRACT

In January, February and March, 1981, data were collected on sex and age composition and behavioural responses to observers of bison in the Mackenzie Bison Sanctuary. The large number of unclassified animals in large herds prevented an accurate assessment of the population composition. Maximum levels of response to observers increased significantly with larger herd sizes.

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INTRODUCTION

Since 1963, when 18 pure wood bison (Bison bison athabascae) were introduced into the Mackenzie Bison Sanctuary, aerial surveys have shown a steady increase in population. Because of the apparently healthy state of the herd, initial selections of animals were to be harvested to provide pathological, physiological, and taxonomic information for wildlife managers (and meat for the people of Fort Providence as a side benefit).

Field investigations of the bison were carried out beforehand, during January, February and March, 1981, to collect information on sex and age composition, and to determine behavioural responses to observers. This was to aid in understanding the population dynamics of the bison and to determine how they would react when in close contact with observers or hunters.

Wood Buffalo National Park (W.B.N.P.) and the Slave River Lowlands (Fig. 1), apart from the Sanctuary, are the only areas in northern Canada with large populations of free-roaming bison. During the annual slaughters from 1952 to 1956 in W.B.N.P., a primary sex ratio of 112 males:100 females was calculated by Fuller (1960). He also carried out sex and age determinations from 1950 to 1953, but his findings were not representative of the entire population.

Behavioural responses of bison to observers and their vehicles is discussed for W.B.N.P. by Fuller (1960), and for the Slave River Lowlands by Calef (1976). As those bison

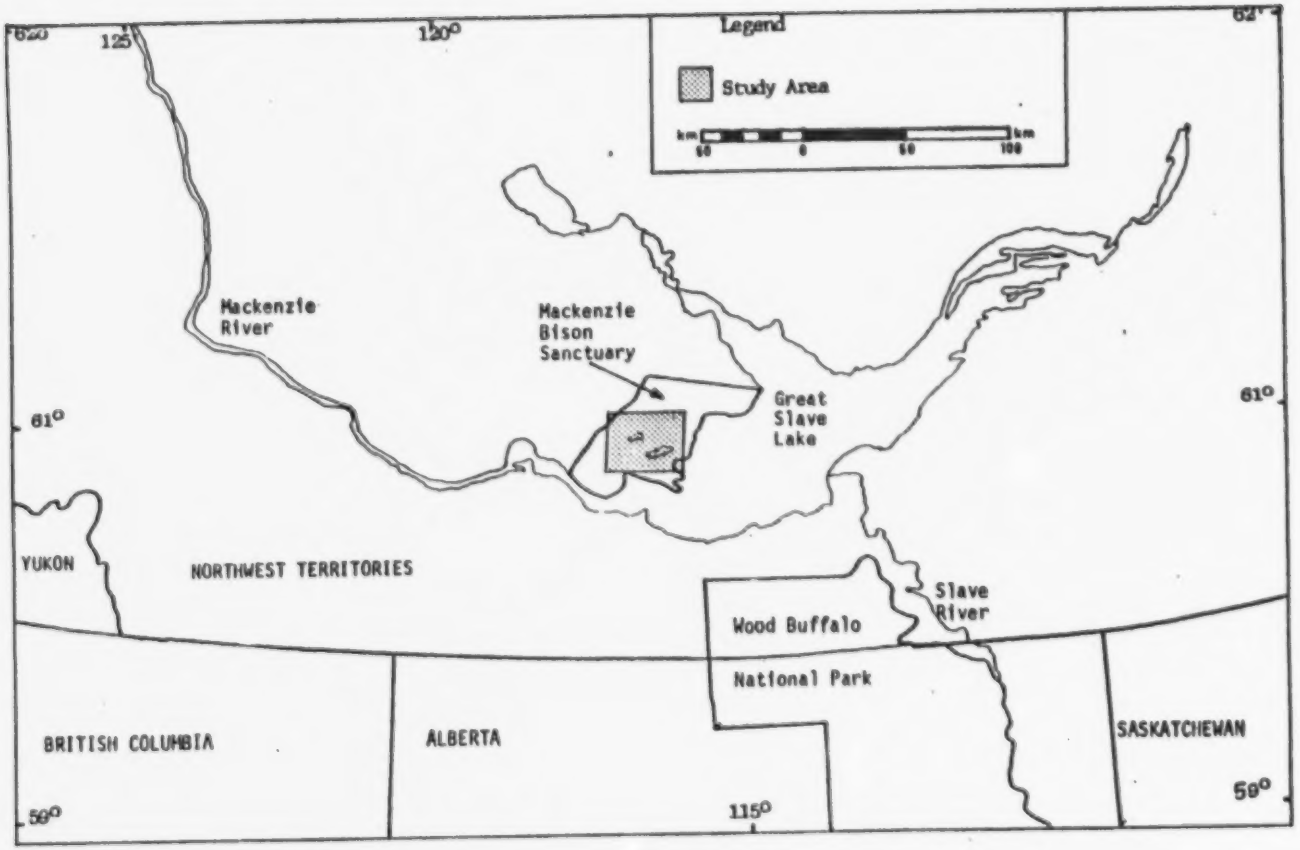

Figure 1. Mackenzie Bison Sanctuary in the Northwest Territories showing study area of winter 1981.

had been subjected to much more extensive contact with humans and vehicles, but little of it in the winter, it is difficult to make comparisons with Sanctuary bison.

The bison concentrate on certain lakes which characteristically contain very little water and receding levels have transformed most of the basins into sedge-grass prairies. The perimeters are being invaded predominantly by willows (Salix spp.). The former shorelines are bordered by a belt of predominantly white spruce (Picea glauca). For the purposes of this report, references to lakes will include their basins.

METHODS

This study was designed so that each survey sampled as many bison as possible over the shortest period of time to obtain a good representation of the population without duplicating observations. Calais, Dieppe, and Falaise lakes (Fig. 2) were surveyed in winter when the bison were expected to be concentrated in those areas and the observers would be highly mobile with oversnow vehicles.

To search most effectively, the lakes were circled by two observers just inside the perimeter of willows for the most unobstructed view of the prairies. When bison were sighted, an observer attempted to approach the middle of the herd perpendicular to its axis of distribution using tall vegetation as a screen whenever possible. When within 200 meters of a herd, a 60 millimeter zoom (15 x to 60 x) telescope was used to determine total number and sex and age composition. Except for calves, sex and age were determined on the basis of horn appearance. This technique (Fuller 1959) was used to distinguish yearlings (1-2 years), spikehorns (2-4 years), young adults (4-7 years), and aged adults (older than 7 or 8 years), for males, while the spikehorn stage in females is not well developed. To aid with observations, photographs were taken with a Minolta, Model SRT 101, 35mm camera with a 240mm Sun lens. Bison sightings were plotted on 1:50,000 scale maps.

Responses were categorized into a chronological sequence from when the bison were first alerted until either

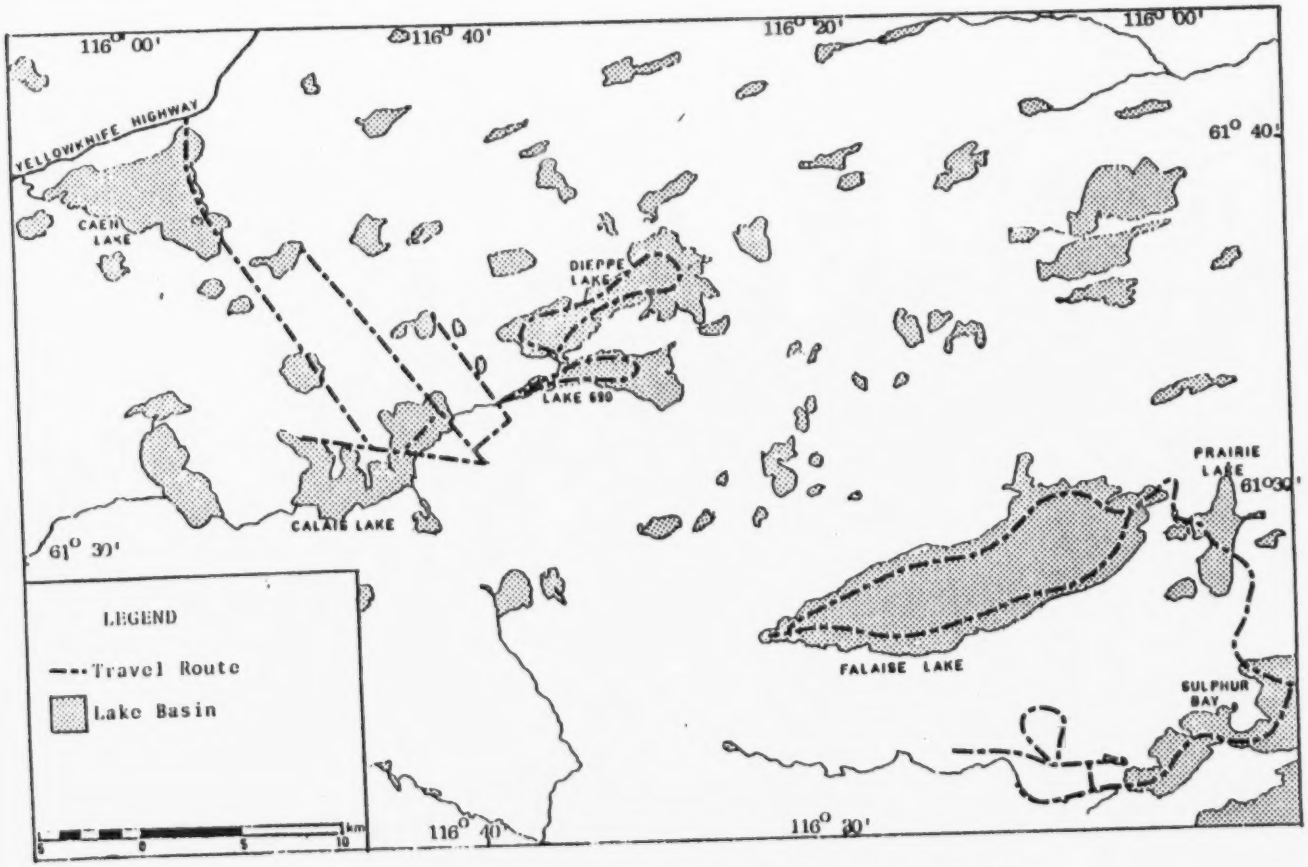

Figure 2. Areas surveyed 29 January, 19 February and 05 March in the Mackenzie Bison Sanctuary.

they, or the observers, departed from the scene. Discontinuation of foraging or standing up from a ruminating position to look at an observer were the first overt signs of alertness. The next level of response recorded was whether the animals began walking away. This was followed by "vigilance", when they were seemingly reassessing the perceived danger and loose herds were congregating. If the bison were sufficiently agitated, flight reaction was recorded as an orderly departure of animals running in single file, which slowed or stopped after a short distance; or a stampede, which did not slow before reaching the forest and the herd seldom thinned out to less than three or four abreast.

RESULTS

29 January Observations

Most of the day was overcast and calm with the temperature staying close to -10 C. From km 89 of the Yellowknife Highway, the observers went across Caen Lake (Fig. 2). No bison were sighted. Tracks indicated that bison in the areas were lone animals or in small groups. A cutline, originating from the southeast end of Caen Lake, was followed south to about the mid-point of Calais Lake. Searching for bison was quite restricted by shrubs on much of this lake and no recent evidence of bison was observed. Because no cutlines lead directly to Dieppe Lake, it was necessary to get as close as possible to the western end of Lake 690 via cutlines, then follow a bison trail east of Lake 690, and another north to Dieppe Lake.

Although tracks revealed that bison had been traversing every cutline and slough that could be observed, all sightings were on Dieppe Lake (Fig. 3). Age and sex data are listed in Table 1.

Trappers' snowmobile tracks crossed Caen and Calais lakes and were found on all cutlines encountered, though there were none on Lake 690 or Dieppe Lake.

19 February Observations

On this date, Falaise Lake was surveyed. The temperature rose to -20 C, winds were light and snow was falling for much of the day. During the previous two days,

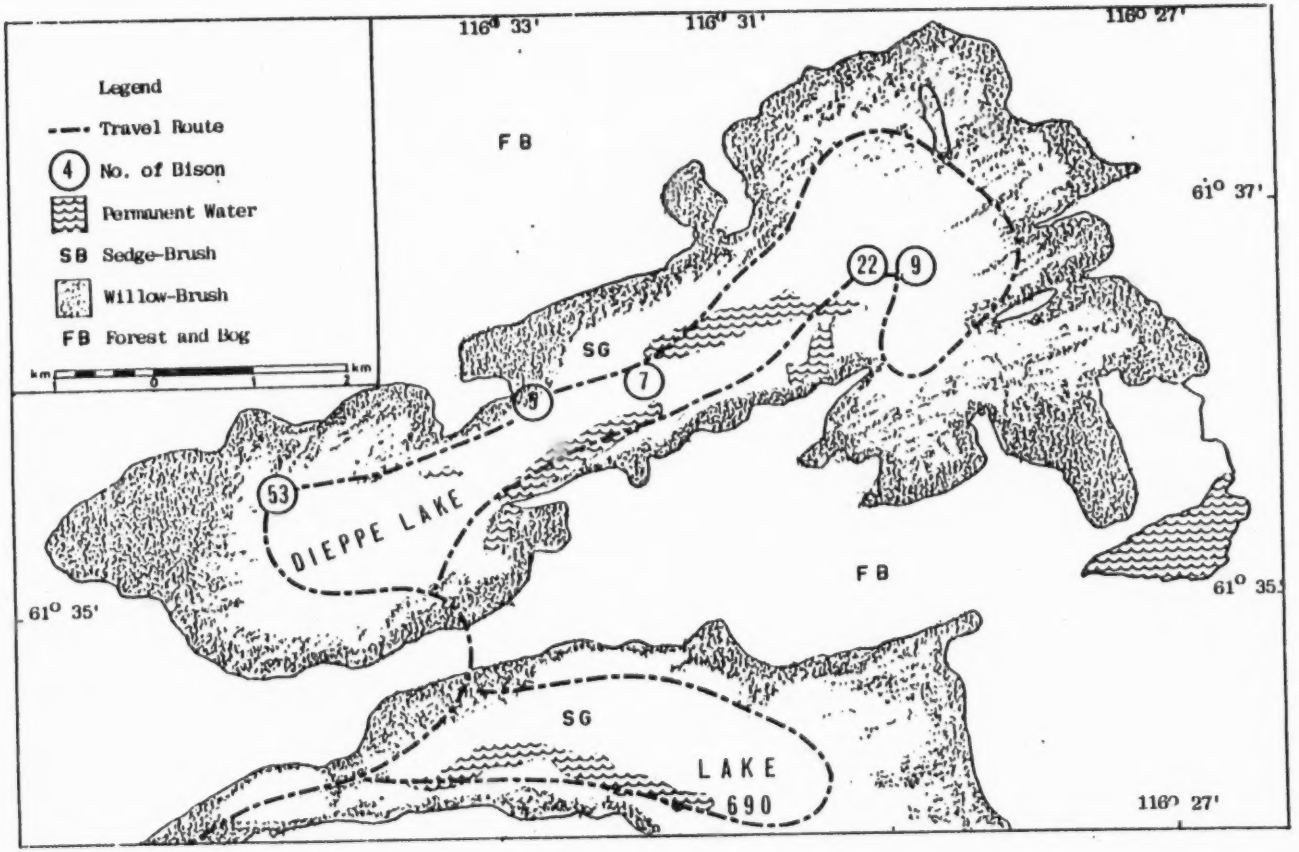

Figure 3. Bison observations on Dieppe Lake, 29 January, 1981.

Table 1. Age structure and sex composition of bison on Dieppe Lake.

Obs.	Herd size	Bulls Age in Years 1	1-2	2-4	4-7	7-8	Cows Age in Years 1	1-2	4-7	7-8	Unclassed Age in Years 1	Other
1	53	0	0	0	1	1	0	0	0	0	14	37
2	5	0	0	0	0	0	0	0	4	0	1	0
3	7	0	0	1	6	0	0	0	0	0	0	0
4	22	0	0	0	0	0	0	0	0	0	5	17
5	9	0	0	0	9	0	0	0	0	0	0	0
TOTAL	96	0	0	1	16	1	0	0	4	0	20	54

the observers attempted to find an old winter road leading to Falaise Lake from the creek flowing into the southwest tip of Sulphar Bay on the west side of Great Slave Lake. As the road was too overgrown, an alternate route from the northwest shore of Sulphur Bay and across Prairie Lake to the eastern end of Falaise Lake was located (Fig. 2).

All bison tracks observed were at or near Falaise Lake, and all bison observations were on that lake (Figs. 4 and 5). Table 2 contains the information on age and sex.

An additional notable observation was of an adult bull moose that had been killed and almost entirely consumed by wolves in the willows fringing the northwest side of the lake. It appeared that the wolves had been feeding upon it recently. The incisor bar was removed for determination of age.

No snowmobile tracks were found on Falaise Lake.

A herd of 58 bison fled into the forest from a low flying aircraft.

05 March Observations

Falaise Lake was resurveyed for comparative purposes, as it was the most useful for gathering information. The temperature reached -5 C with light winds, and the sky remained overcast. The same route to the lake via Sulphur Bay and Prairie Lake was followed as in February (Fig. 2). Falaise Lake was surveyed basically in the same manner as during the previous trip.

As before, all observations of bison were on Falaise

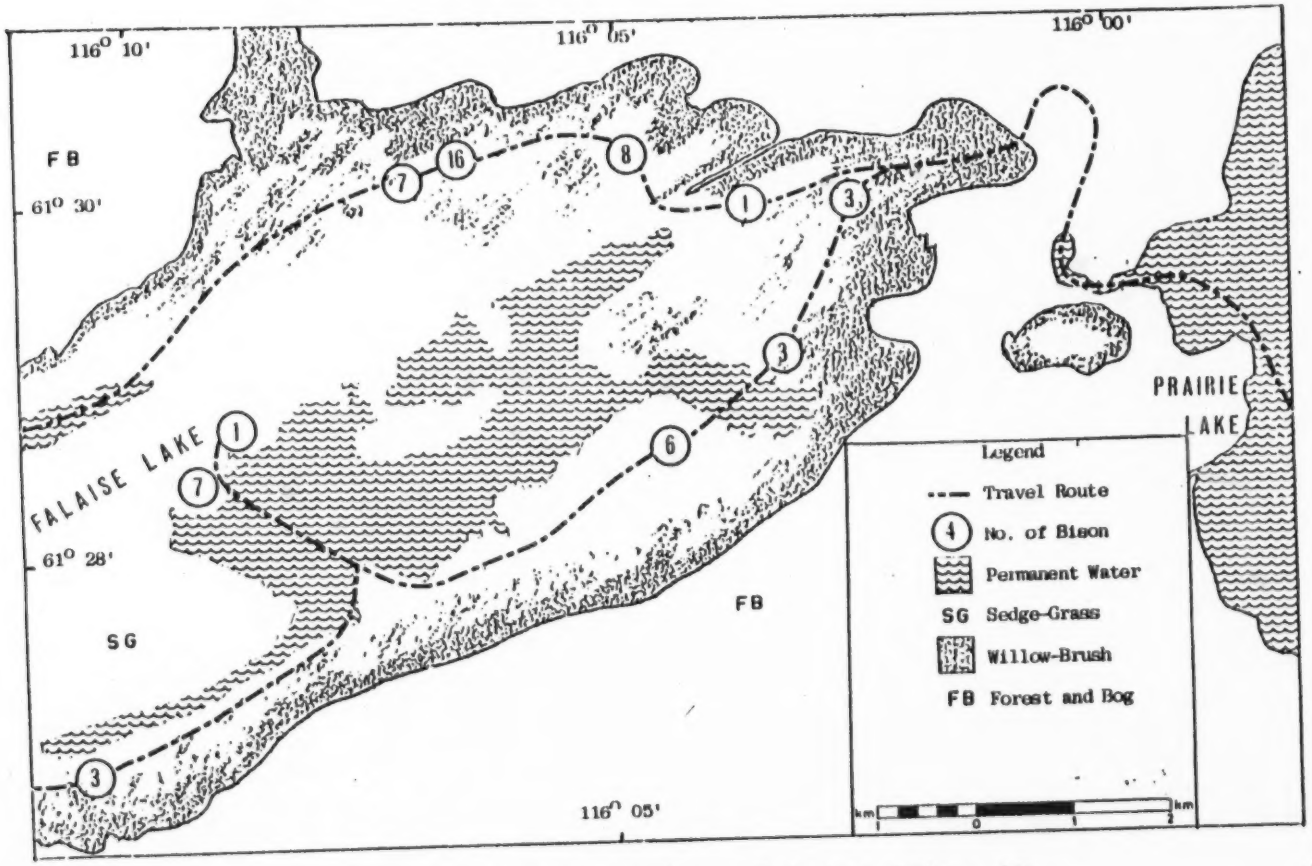

Figure 4. Bison observations on eastern Falaise Lake, 19 February, 1981.

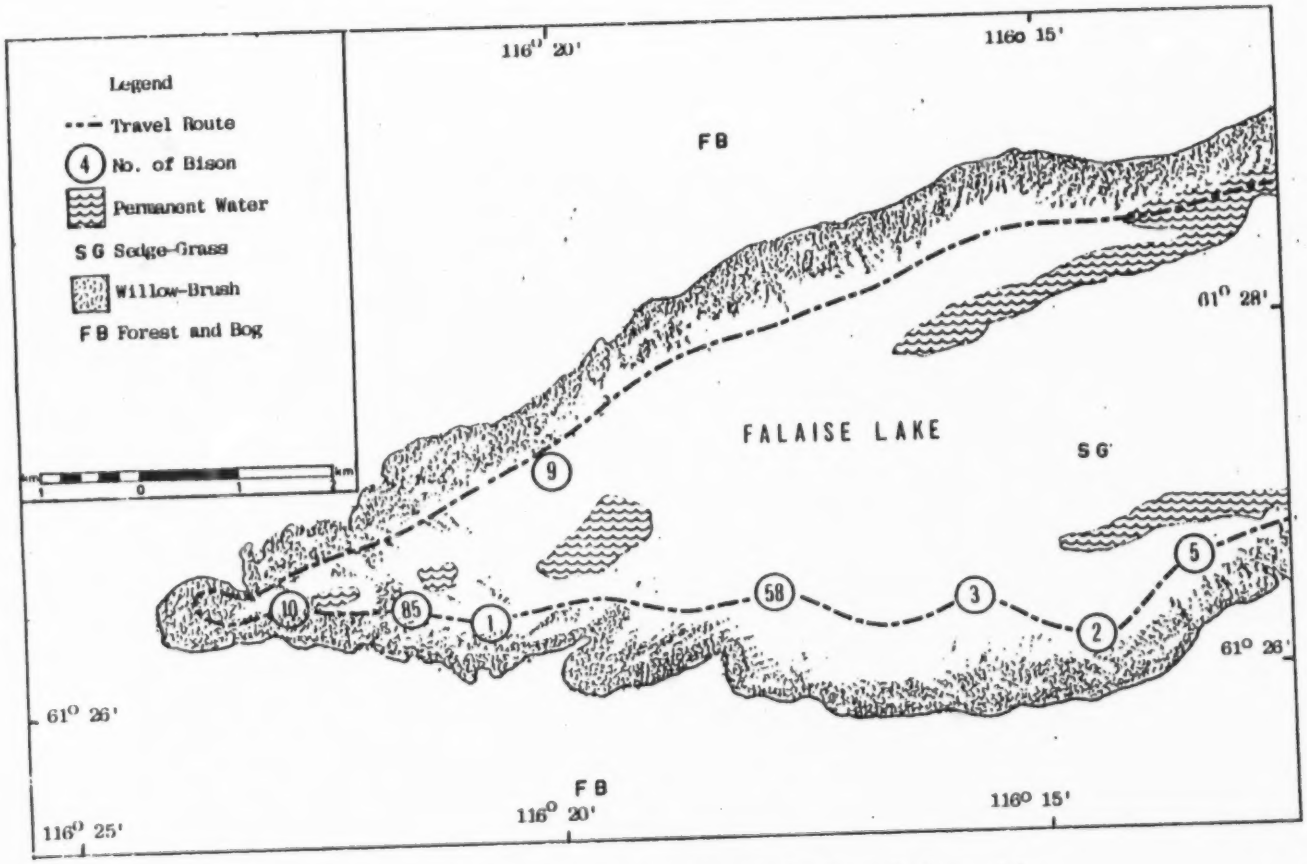

Figure 5. Bison observations on western Falaise Lake, 19 February, 1981.

Table 2. Age structure and sex composition of bison on Falaise Lake 19 February, 1981.

Obs.	Herd Size	Bulls Age in Years					Cows Age in Years				Unclassed Age in Years	
		1	1-2	2-4	4-7	7-8	1	1-2	4-7	7-8	1	Other
6	3	0	0	0	1	0	0	0	1	0	1	0
7	3	0	0	1	1	1	0	0	0	0	0	0
8	6	0	0	0	1	1	0	0	0	0	0	4
9	7	0	0	0	2	0	0	0	4	0	1	0
10	1	0	0	0	0	1	0	0	0	0	0	0
11	3	0	0	0	0	0	0	0	0	0	0	3
12	5	0	0	0	4	1	0	0	0	0	0	0
13	2	0	0	0	2	0	0	0	0	0	0	0
14	3	0	0	0	2	1	0	0	0	0	0	0
15	58	0	0	0	0	0	0	0	2	1	10	45
16	1	0	0	0	0	1	0	0	0	0	0	0
17	85	0	0	0	0	0	0	0	0	0	16	69
18	10	0	0	0	4	0	0	0	0	2	0	4
19	9	0	0	0	5	0	0	0	4	0	0	0
20	7	0	0	0	3	0	0	0	4	0	0	0
21	16	0	0	0	0	0	0	0	2	0	2	12
22	8	0	3	0	4	1	0	0	0	0	0	0
23	1	0	0	0	0	1	0	0	0	0	0	0
TOTAL	228	0	3	1	29	8	0	0	17	3	30	137

Lake (Figs. 6 and 7). Information collected on age structure and sex composition is recorded in Table 3.

The moose carcass was re-examined and did not appear to have been visited by wolves since it was first discovered.

The snowmobile tracks found on the lake were from the previous survey and they were almost obliterated by snow. The closest traplines were up to Prairie Lake on the east and along a cutline running almost parallel to the northwest side of the lake, about 1 km away.

Responses to observers are listed in Tables 4 and 5 according to herd size for all survey days.

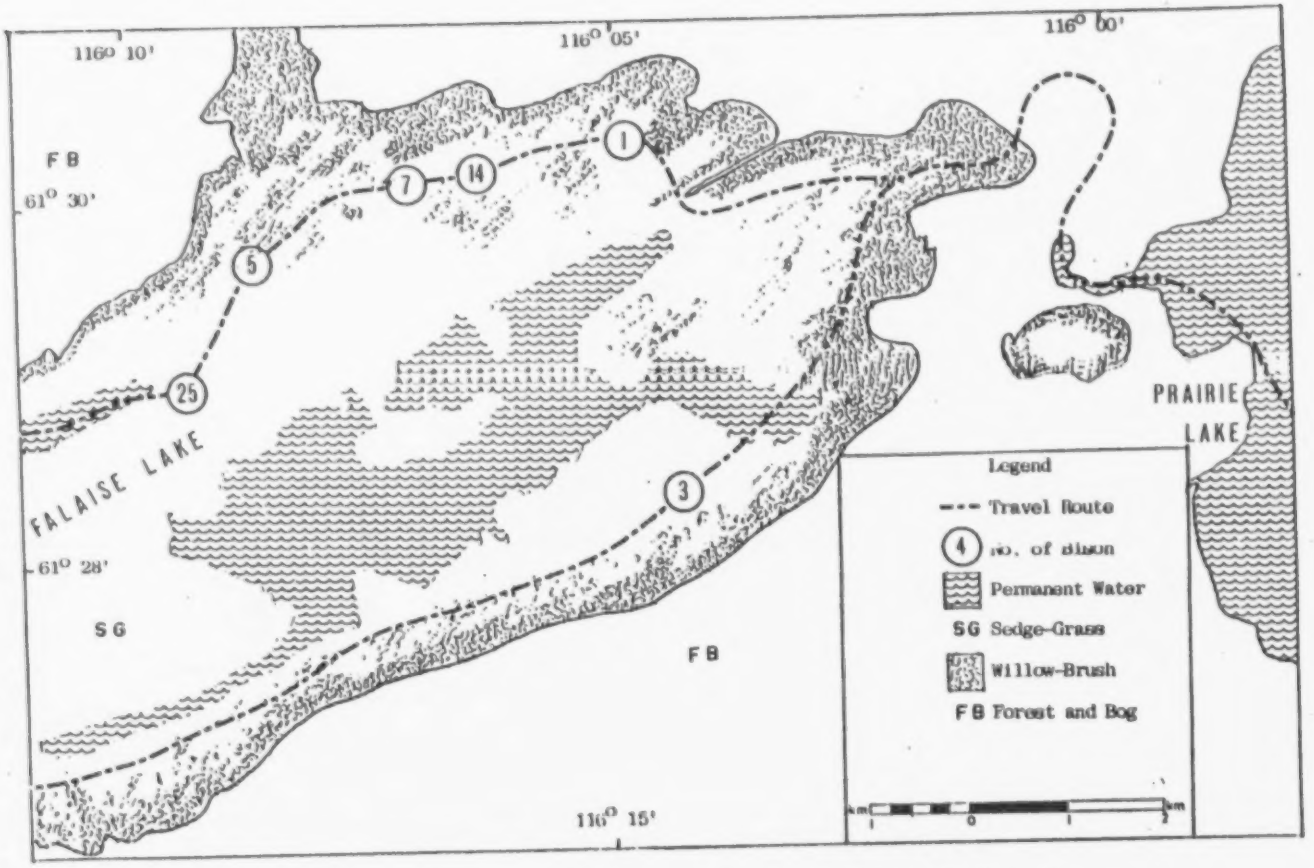

Figure 6. Bison observed on eastern Falaise Lake, 05 March, 1981.

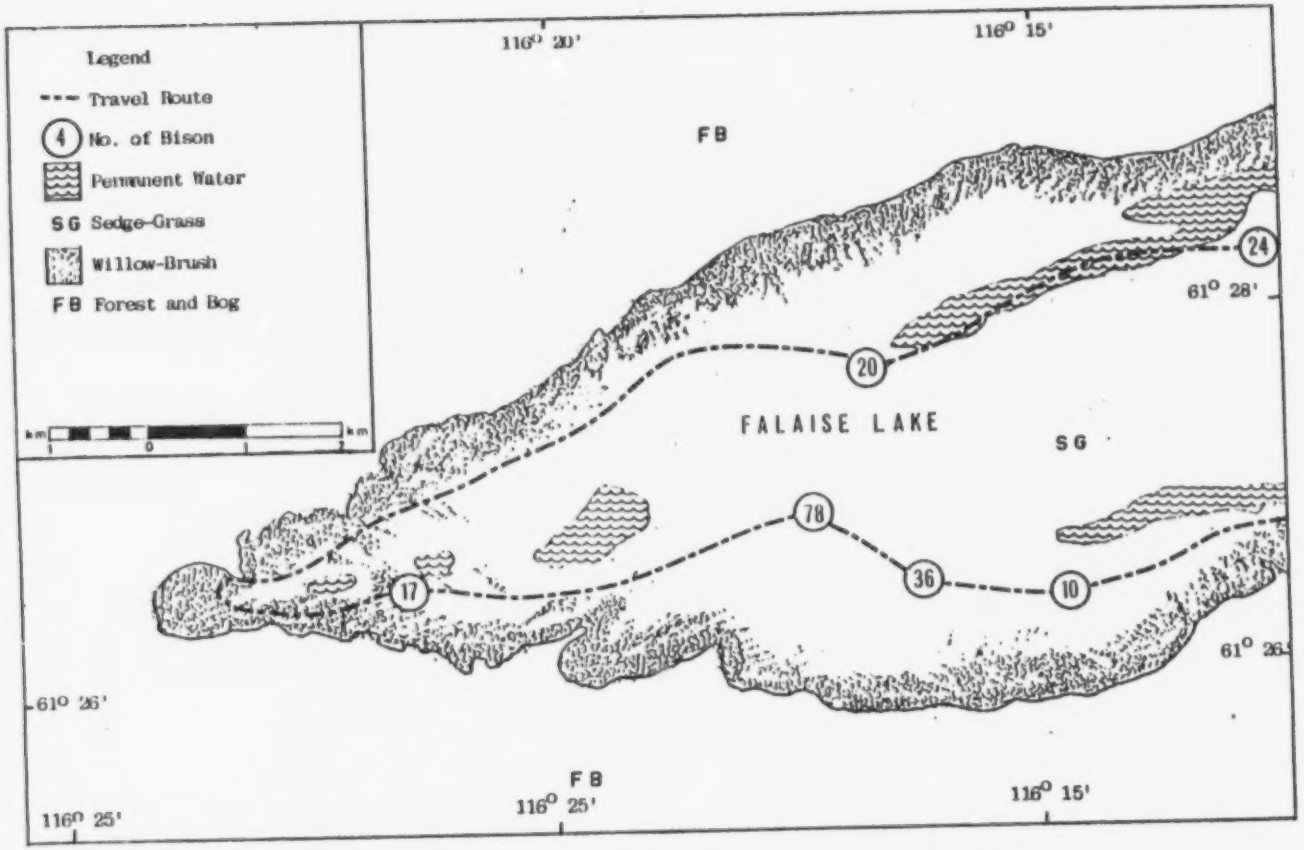

Figure 7. Bison observations on western Falaise Lake, 05 March, 1981.

Table 3. Age structure and sex composition of bison on Falaise Lake 05 March, 1981.

Obs.	Herd Size	Bulls Age in Years 1	1-2	2-4	4-7	7-8	Cows Age in Years 1	1-2	4-7	7-8	Unclassed Age in Years 1	Other
24	3	0	0	2	0	1	0	0	0	0	0	0
25	10	0	1	3	6	0	0	0	0	0	0	0
26	36	0	0	0	0	2	0	0	2	0	6	26
27	78	0	0	0	0	0	0	0	4	0	10	64
28	17	0	2	3	2	1	0	0	3	0	2	4
29	20	0	0	0	0	0	0	0	0	0	3	17
30	24	0	0	0	0	1	0	0	0	0	2	21
31	25	0	0	2	0	0	0	0	2	0	0	21
32	5	0	0	1	1	0	0	0	0	0	0	3
33	7	0	3	0	4	0	0	0	0	0	0	0
34	14	0	1	1	0	0	0	1	8	3	0	0
35	1	0	0	0	0	1	0	0	0	0	0	0
TOTAL	240	0	7	12	13	6	0	1	19	3	23	156

Table 4. Reaction of bison to observers in the Mackenzie Bison Sanctuary on 29 January, 19 February and 05 March, 1981.

Obs. No.	Herd Size	Stand	Walk	Vigilance	Flee Orderly	Stampede
10	1	———				
16	1	———				
23	1	———				
35	1	———				
13	2				———	
06	3		———	———		
07	3	———				
11	3				———	
14	3		———			
24	3	———				
02	5				———	
12	5	———				
32	5				———	
08	6		———		———	
03	7				———	
09	7	———				
20	7	———				
33	7	———				
22	8	———				
05	9		———			
19	9	———				
18	10	———				
25	10	———				

Table 4. (Continued)

Obs. No.	Herd Size	Stand	Walk	Vigilance	Flee Orderly	Stampede
34	14	———				
21	16				———	
28	17		———			
29	20		———		———	
04	22		———			
30	24		———		———	
31	25		———	———		
26	36		———			
01	53			———		———
15	58			———		———
27	78			———		———
17	85			———		———

Table 5. Calculations of chi-Square to test the hypothesis that maximum levels of response are independent of herd size.

Herd Size		Stand	Walk	Vigilance	Flee orderly	Stampede	Total
1-3	f^*	6	1	1	2	0	10
	f	3.14	2.57	0.57	2.57	1.14	10
	y	2.86	-1.57	0.43	-0.57	-1.14	0
	x^2	2.6050	0.9591	0.3244	0.1264	1.1429	5.1578
5-10	f^*	4	5	0	4	0	13
	f	4.09	3.34	0.74	3.34	1.49	13
	y	-0.09	1.66	-0.74	0.66	-1.49	0
	x^2	0.002	0.822	0.7429	0.6543	1.4857	3.7053
14-25	f^*	1	2	1	3	0	7
	f	2.2	1.8	0.4	1.8	0.8	7
	y	-1.2	0.2	-.6	1.2	-0.8	0
	x^2	0.0411	0.022	0.9000	0.8000	0.8000	2.5633
36-85	f^*	0	1	0	0	4	5
	f	1.5	1.3	0.29	1.29	0.57	5
	y	-1.5	-2.3	-0.29	-1.29	3.43	0
	x^2	1.5714	0.0628	0.2857	1.2857	20.6230	23.8286
TOTAL	f^*	11	9	2	9	4	35
	f	11.93	9	2	9	4	35
	y	0	0	0	0	0	0
	x^2	4.2177	1.8663	2.2530	2.8664	24.0516	35.2550

$x^2 = 35.255$

df = 12

p = 0.05

*f = observed frequency, f = expected frequency, y = (f^*-f),

x^2 = Chi-Square

DISCUSSION

Sex and Age Composition

In tables 1, 2 and 3, there is an excessive number of unclassified animals which do not allow for an unbiased estimate of the sex and age ratios of the population. The observations of bison which were most easily surveyed usually consisted of bulls older than 4 years. Herds that were difficult to classify were a mixture of sexes and age groups. Although calves were easily identified because of their small size, some were undoubtedly obscured from detection in tightly congregated groups, as almost 80% of them occurred in herds larger than 25 individuals.

Alternative techniques may improve the gathering of this information. Blinds along travel routes would be very beneficial if mass movements could be predicted. During the rut, bison are expected to be prevalent in small (< 50) mixed groups (Calef 1976). This may be an opportune time to sample a good cross-section of the population if it is not too widely distributed.

Behavioural Responses to Observers

Table 4 shows that response levels were sometimes attained gradually while at other times bison fled almost immediately after the observers were noticed. The bison in each observation exhibited a very definite maximum response. When an individual increased its reaction level, the majority of its companions followed suit.

From Table 5, there is evidence that maximum levels of response are associated with herd size. Singles, pairs and groups of three could usually be approached without causing a flight reaction, whereas the larger herds containing cows and calves tended to be most easily disturbed. Tall vegetation was not effective as cover for approach because it was invariably sparse where the animals were located.

All bison were quite sensitive to the emergence of the second snowmobile and extraneous movements of the observers. Difference in such factors as time of day, season, winds, position of the sun, physiological state of the animals, and their proximity to trees may also have had effects on thresholds of reaction to observers.

ACKNOWLEDGEMENTS

I wish to thank Jim Beaulieu of the NWT Wildlife Service for his assistance in the field as an observer and able advisor on bison habits, and Vernon Hawley for his critical review of the manuscript. However, the procedures, analyses, and conclusions, along with whatever errors may be included, are solely my responsibility.

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